

Thermal Soaring Techniques I

Attitude/Airspeed Control, Angle of bank

Why do we circle in thermals?

- we're trying to "park" the glider in rising air
- we'd like to just stop—but can't because of our stall speed

What is the goal when we circle in thermal lift?

- we're trying to maximize our climb rate
 - ...by spending our time in the best lift around
 - ...by continuously positioning ourselves in the best lift
- we're trying to minimize our still-air sink rate
 - ...by choosing the best combination of IAS and bank angle

We'll talk about centering technique at another time. Right now, let's talk about flying our circles as accurately as possible.

To minimize the size of our circle, we need to fly a truly circular circle—that is, we need to maintain a constant rate of turn. We do this by maintaining a constant airspeed and a constant angle of bank. Let's look at each of these separately first; then, we'll combine them at the end.

Flying a constant airspeed

How many ways can we sense changes in our airspeed?

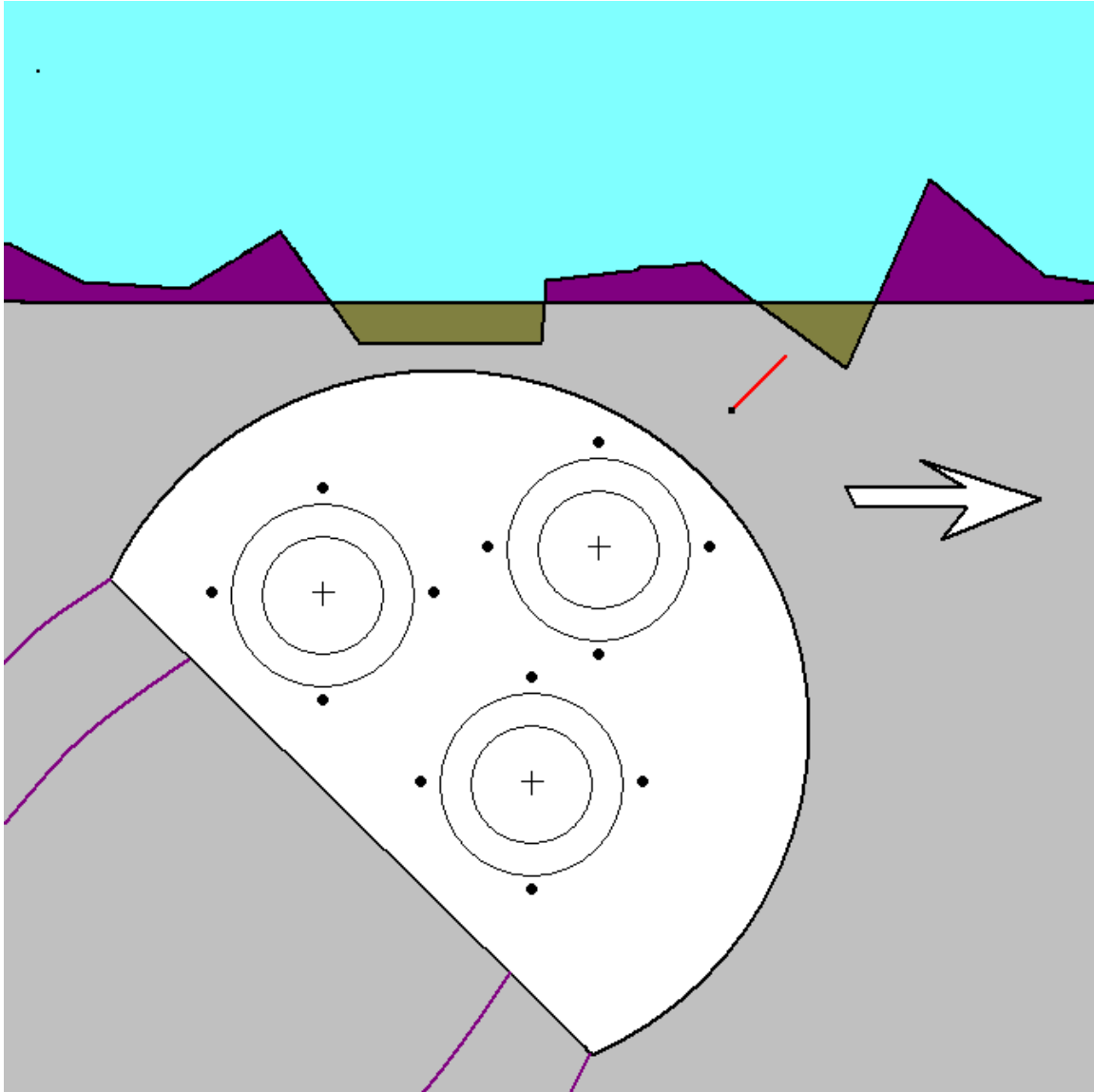
- we can watch the airspeed indicator
- we can listen to the wind noise
- we can notice changes in control effectiveness
- we can notice changes in control feel
- we can notice changes in our pitch attitude

Of these five, **only pitch attitude** will tell us what the speed is going to be in the future!

The only way to quickly and accurately sense pitch attitude is to look out over the nose and to watch for changes in the nose/horizon "picture"—we want to see that the nose is smoothly tracking along the horizon, neither rising nor falling.

By concentrating on pitch attitude, we can detect and correct small pitch changes before they have a chance to affect our airspeed!

When we detect a small unwanted change in pitch attitude, we should smoothly “fly” the nose back to the proper attitude—then keep it there. Cross-checking the airspeed indicator, we can see if our chosen attitude was correct; if not, we make another small correction to a new attitude—and then hold that attitude.



As the sketch indicates, the nose should smoothly track along the horizon, neither rising nor falling. While in the real world the horizon is seldom perfectly obvious—it is often obscured by nearby terrain—use your imagination to “see through” these obstructions and watch to see the nose move only in the direction of the arrow drawn above.

The Airspeed Indicator is a back-up reference for our attitude control—NOT the other way around! Fly attitude; cross-check with your ASI.

Flying a Constant Angle of Bank

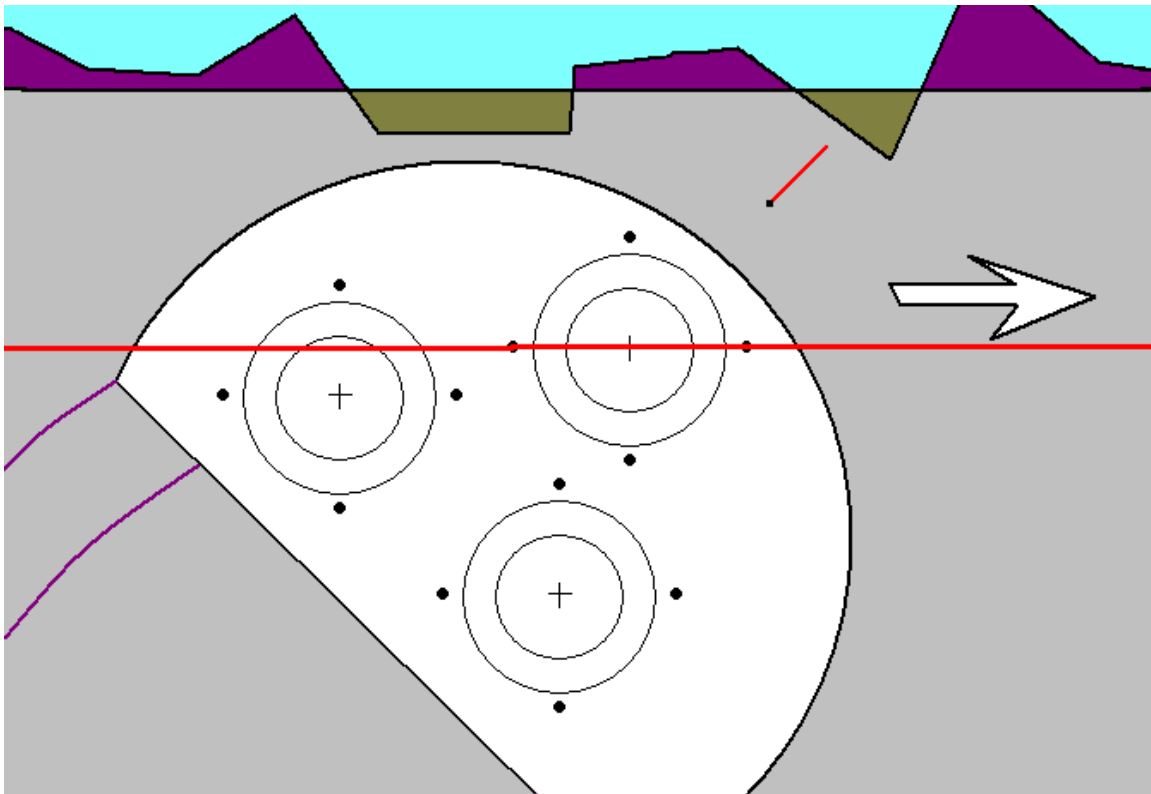
For reasons we'll discuss at another time, a 45-degree bank angle is often the best choice when using thermals here in the Great Basin. Actually, there is a range of bank angles that would all work just about as well—except that only 45 degrees has a ready reference already installed in the cockpit of every sailplane.

How do we check for a 45-degree angle of bank in a glider?

Most of the round instruments are fastened to the panel with four screws arranged in a square around each instrument.

A line through any two diagonal screws will parallel the horizon if and only if the glider's angle of bank is precisely 45 degrees.

Here's what a 45-degree angle of bank should look like:



In the sketch, notice how the red line drawn through two diagonal screws on the instrument nearest the horizon parallels the horizon. The natural horizon, the arrow depicting the path of the nose and the red line are ALL parallel.

Of course, the yaw string is nice and straight, too!

Putting It All Together

These two sketches depict an idealized situation: the pitch attitude and bank are held perfectly constant and the yaw string is centered. But is this so difficult to achieve? Not at all. Here's how:

Whenever a sailplane is rolling—or the attitude is changing in any way--the pilot should be looking right over the nose, thus making it easy to monitor the changing attitude. Entering or leaving a turn, in a sailplane, is a complex maneuver requiring precise control about all three axes. Give yourself a fighting chance to do it right: simply watch what you're doing!

Generally speaking, in most situations we have a period of several seconds during which we are planning to enter a turn. Use that time to carefully clear the airspace into which you'll be turning, then—immediately before beginning the turn—snap your eyes to the front. Take in the entire nose/horizon "picture," then watch how the turn entry progresses. As you reach the desired angle of bank (which will probably be 45 degrees, right?), apply the outside aileron needed to hold the bank where you want it. Naturally, this will require an adjustment to your rudder control input, and probably a minor pitch correction as well. Once these tasks have been accomplished—and ONLY then—take a look around, then once again sweep your eyes to the nose to check that your attitude hasn't changed. Continue this rhythm (look around, check attitude, look around, check attitude,...) until it's time to roll out of the turn; then, once again, snap your eyes to the nose and watch the rollout maneuver unfold. Pretty soon your turns will consistently be just about perfect, every time. Really, it's easy.

And perfect turns are part of the secret to better thermaling.